Claims

1. A magnetic field sensing structure comprising a first electrode and a second electrode, the first and second electrodes being electrically coupled via a network comprising a plurality of discrete semiconducting elements providing a plurality of possible current paths between the electrodes.

2. A magnetic field sensing structure as claimed in claim 1 in which the elements are disposed in a regular array.

3. A magnetic field sensing structure as claimed in claim 2 in which the array defines a rectangular grid.

4. A magnetic field sensing structure as claimed in claim 2 in which the array defines a hexagonal grid.

5. A magnetic field sensing structure as claimed in claim 1 in which the elements are disposed in an irregular array.

6. A magnetic field sensing structure as claimed in claim 1 in which elements within the network are electrically coupled to three other elements.

7. A magnetic field sensing structure as claimed in claim 1 in which elements within the network are electrically coupled to four other elements.

8. A magnetic field sensing structure as claimed in claim 1 in which elements within the network are electrically coupled to at least three other elements, the number of electrical couplings varying between different elements within the network.

9. A magnetic fields sensing structure as claimed in claim 1 in which some first elements within the network are electrically coupled to three other elements, and in which some second elements within the network are electrically coupled to four other elements.

10. A magnetic field sensing structure as claimed in claim 2 in which the array has first and second edge rows of elements defining first and second opposing edges and in which the electrodes are electrically coupled to the elements of the said edge rows.

11. A magnetic field sensing structure as claimed in claim 1 in which the elements are disk-shaped.

12. A magnetic field sensing structure as claimed in claim 1 in which the elements are diamond-shaped.

13. A magnetic field sensing structure as claimed in claim 1 in which the dimensions of the elements are smaller than 1μm.

14. A magnetic field sensing structure as claimed in claim 1 in which the dimensions of the elements are approximately 0.1μm.

15. A magnetic field sensing structure as claimed in claim 1 in which the dimensions of the elements are larger than the mean free path of charge carriers within the elements.

16. A magnetic field sensing structure as claimed in claim 1 in which the elements are formed of any one or more of GaAs, InSb, AlAs, InGaAs, InAs, InSb, InGaNAs, GaN, Ge, SiGe or Si.

17. A magnetic field sensing structure as claimed in claim 1 in which the carrier mobility differs between different elements.

18. A magnetic field sensing structure as claimed in claim 17 in which the individual element carrier mobilities define a distribution having a mean and a spread, the spread being greater than the mean.

19. A magnetic field sensing structure as claimed in claim 17 in which the individual element carrier mobilities define a distribution which is substantially Gaussian.

20. A magnetic field sensing structure as claimed in claim 1 in which a physical element dimension differs between different elements.

21. A magnetic field sensing structure as claimed in claim 1 in which the semiconducting elements are interconnected by means of conductive connections.

22. A magnetic field sensing structure as claimed in claim 21 in which the conductive connections comprise metal wires or pathways.

23. A magnetic field sensing structure as claimed in claim 1 in which the semiconducting elements are interconnected by direct contact, one with the other.

24. A magnetic field sensing structure as claimed in claim 1 in which the semiconducting elements are disposed on a substrate.

25. A magnetic field sensing structure as claimed in claim 24 in which the elements are applied to the substrate by lithography.

26. A magnetic field sensing structure as claimed in claim 1 in which the semiconducting elements are disposed on a substrate and are interconnected by virtue of a partial overlap, one with the other.

27. A magnetic field sensing structure as claimed in claim 1 in which an electrical property of at least one of the elements is controllable in real time.

28. A magnetic field sensing structure as claimed in claim 27 in which each element includes a controllable gating structure.

29. A magnetic field sensing structure as claimed in claim 1 in which the network extends in three dimensions.

30. A magnetic field sensing structure as claimed in claim 29 in which the elements are spherical or octahedral.

31. A magnetic field sensing structure as claimed in claim 29 in which the elements define a simple cubic array.

32. A magnetic field sensor comprising a sensing structure as claimed in claim 1 and a resistance-measuring device for measuring the electrical resistance between the electrodes at a given magnetic field strength.

33. A magnetic read-head including a sensing structure as claimed in claim 1.

34. A read-head as claimed in claim 32 comprising a hard disk or a tape read-head.

35. A magnetic field sensor comprising a sensing structure as claimed in claim 28, a resistance-measuring device for measuring the electrical resistance between the electrodes at a given magnetic field strength, and a mobility controller for tuning the magnetorestorative response of the sensing structure.

36. A magnetic field sensing structure as claimed in claim 27 in which the said electrical property is carrier density.

37. A magnetic field sensing structure as claimed in claim 27 in which the said electrical property is a carrier mobility.

38. A magnetic field sensing structure as claimed in claim 28 in which the gating structure is electronically-gated.

39. A magnetic field sensing structure as claimed in claim 28 in which the gating structure is optically-gated.

40. A magnetic field sensing structure as claimed in claim 1 in which the said elements have substantially identical electrical properties.

41. A magnetic field sensing structure as claimed in claim 1 in which the electrical properties of the said element differ.